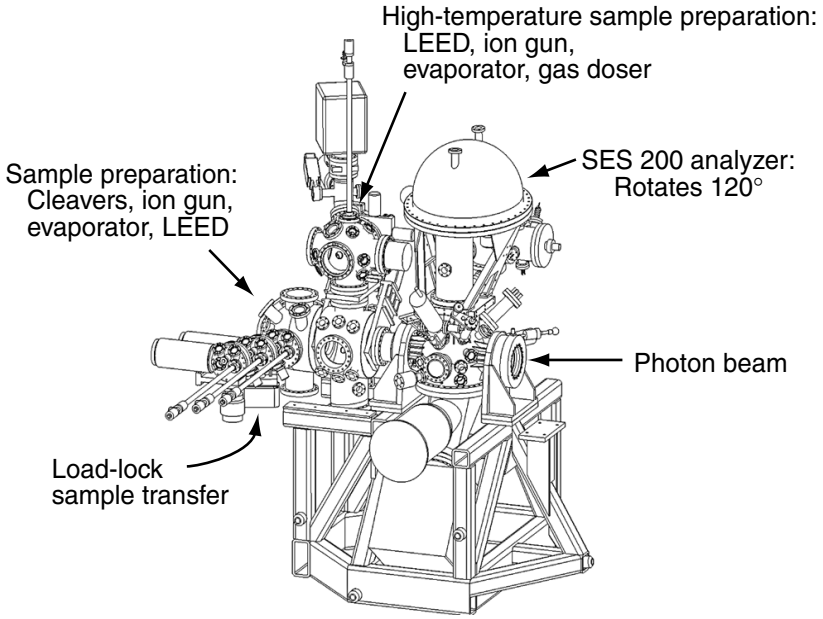
High Energy Resolution Spectrometer (HERS) • Beamline 10.0.1

Berkeley Lab • University of California

Endstation Specifications

Photon Energy Range (eV)	Photon Flux (photons/s/0.01%BW)	Spectral Resolution (E/ΔE)	Spot Size (μm)	Availability
17–340	$\leq 10^{12}$ (resolution dependent)	>10,000 (selectable by slit width)	150 (h) × <100 (v) (dependent upon exit slit setting)	NOW



HERS endstation.

Beamline 10.0.1 contains three branchlines, one of which is dedicated to the High Energy Resolution Spectrometer (HERS). The remaining two branchlines (managed by a separate PRT) are dedicated to the Atomic and Molecular Facility (AMF), whose endstations are described in separate data sheets.

The HERS endstation was designed to do very high-resolution angular-resolved photoemission spectroscopy at cryogenic temperatures. With this in mind, the heart of the endstation is a Gammadata Scienta electron-energy analyzer with excellent energy resolution and very good angular resolution. The strength of this instrument is its ability to simultaneously collect data over a ±7° emission angle with ±0.15° resolution, while maintaining excellent energy resolution. At a photon energy of 21 eV, the combined energy resolution from the beamline and analyzer is 8 meV. The analyzer is mounted to the main experimental chamber, which can rotate 120° about the incoming beam, enabling polarization-dependent studies utilizing a constant emission angle.

Equally as important as the endstation is the sample manipulator. The motorized XYZ stage is equipped with linear encoders to enable precise and reproducible movements with 100-μm accuracy. The manipulator also features two degrees of angular movement, both computer controlled with precision better than 0.25°. Additionally, the combination of a

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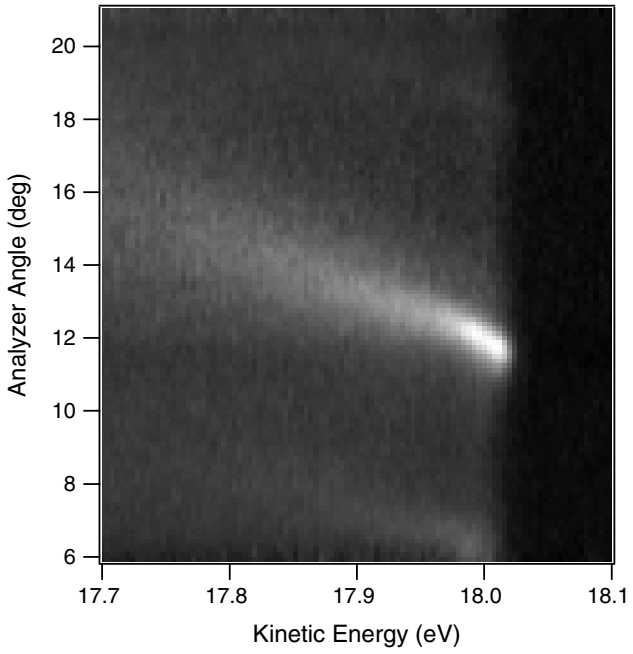
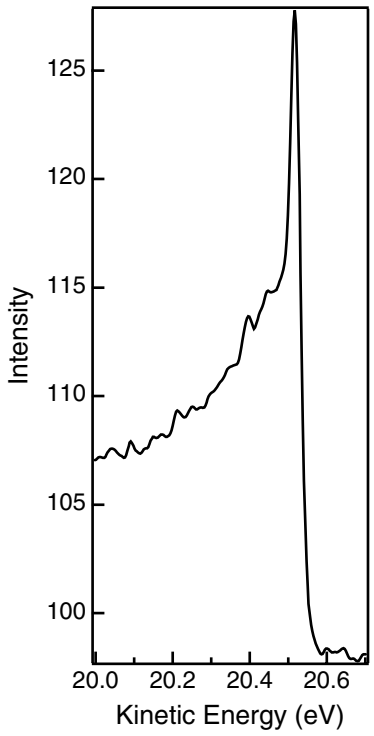
LHe-cooled cryostat and temperature controller allows experimenters to choose a sample temperature from 12–450 K with better than 1° accuracy.

Also of special note is the sample transfer system. As many delicate samples cannot withstand the elevated temperatures of a "bake-out," the HERS endstation is equipped with a three-stage load-lock system. Each stage of the load-lock has parking space for 13 samples. In practice, it is possible to move a sample from atmosphere through the stages of the load-lock and onto the sample manipulator in the main chamber, where the base pressure is better than 4×10^{-11} Torr, in less than three hours.

The preparation chamber is separated from the main analyzer chamber by a vacuum valve and has the usual surface science equipment, i.e., evaporators, leak valves, cleavers, sputtering gun, and a LEED system. For high-temperature sample preparation, a second preparation chamber is available, also outfitted with same surface-science tools. ■



A "snap shot" image collected with the HERS analyzer *showing the quasi-particle in Bi2212 dispersing to the Fermi level. The y axis represents the 14° cone of photoelectrons collected simultaneously from the analyzer. The x axis is the kinetic energy of the electrons. Data courtesy of P.V. Bogdanov (Stanford University) et al.*



One of the more than seventy individual spectra *that make up the image on the left. The energy resolution for this spectrum is 10 meV, the angular resolution is ±0.15°. Data courtesy of P.V. Bogdanov (Stanford University) et al.*

This endstation is available to independent investigators by submitting a proposal.

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